

Buffer solutions

1) a) A mixture of aqueous solutions of NH_3 and ammonium chloride, NH_4Cl , can act as a buffer solution. Calculate the mass of NH_4Cl required, when added to 250 mL of a 0.150 mol L^{-1} NH_3 solution, to give a buffer solution with a pH of 8.60. Assume there is no change in volume.

$M(\text{NH}_4\text{Cl}) = 53.5 \text{ g mol}^{-1}$

$\text{p}K_a(\text{NH}_4^+) = 9.24$

b) Discuss the ability of the $\text{NH}_3 / \text{NH}_4\text{Cl}$ solution to act as a buffer at a pH of 8.60.

In your answer you should:

- describe the function of a buffer solution
- evaluate its effectiveness when small amounts of acid or base are added
- include any relevant equations.

2) A buffer solution is made by adding solid sodium methanoate, HCOONa , to an aqueous solution of methanoic acid, HCOOH . $\text{p}K_a(\text{HCOOH}) = 3.74$

a) Describe the function of a buffer solution.

b) Explain why the solution made with methanoic acid, HCOOH , and sodium methanoate, HCOONa , has the ability to act as a buffer. *Your answer should include relevant equations.*